APPLICATION FOR

UNITED STATES LETTER PATENT

[1] This application claims benefit as a continuation application of co-pending U.S. Patent Application Serial No. 10/154,421 filed May 23, 2002, entitled "Quick Position Clamp and Vise", which claims priority to provisional U.S. Patent Application Serial No. 60/292,999 filed May 23, 2001, entitled "Quick Position Clamp and Vise" both of which are hereby incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

[2] The present invention relates generally to clamping systems and more specifically, this invention relates to c-clamps and vises and provides an improved quick position method and apparatus for use of these devices.

[3] Several United States Patents describe clamping systems. These include: United States Patent No. 298,704 issued to Norris et al. on May 13, 1884; United States Patent No. 823,748 issued to Walden on June 19, 1906; United States Patent No. 825,151 issued on McLean on July 3, 1906; United States Patent No. 947,619 issued to Orr on January 25, 1910; United States Patent No. 1,140,646 issued to Abernathy on May 25, 1915; United States Patent No. 2,430,458 issued to Farrell on November 11, 1947; United States Patent No. 3,357,698 issued to Flynn on December 12, 1967; United States Patent No. 3,492,886 issued to Naureckas on February 3, 1970; United States Patent No. 4,083,624 issued to Timmer on April 11,

1978; United States Patent No. 4,262,892 issued to Wu on April 21, 1981; United States Patent No. 4,534,547 issued to Cox on August 13, 1985; United States Patent No. 4,753,427 issued to Lodrick, Sr., on June 28, 1988; United States Patent No. 4,925,169 issued to Lodrick, Sr., on May 15, 1990; United States Patent No. 5,241,736 issued to Allison on September 7, 1993; United States Patent No. 6,098,973 issued to Khachatoorian on August 8, 2000; United States Patent No. 6,250,621 issued to Ping on June 26, 2001; and United States Patent No. 6,296,241 issued to Harrison on October 2, 2001. Each of these patents is hereby incorporated by reference.

[4] Of particular note in this list of patents is United States Patent No. 6,296,241, issued to Harrison on October 2, 2001, entitled Adjustable C-Clamp. This patent describes an adjustable C-Clamp including a frame which receives a clamp cylinder at the top clamp seat. A slotted cylinder is then secured in the clamp cylinder such that a clamp rod may be moveably disposed in the slotted cylinder for a quick movement in and out of the cylinder. A clamp rod pin is positioned on the clamp rod to engage the slotted cylinder. The clamp rod pin is designed to traverse a pair of parallel, diametrically-opposed a longitudinally cylinder slots in the slotted cylinder to facilitate slideably adjusting the clamp rod in the slotted cylinder. Rotation of the clamp rod in the clamp cylinder seats the pins in a pair of multiple spaced-apart pin slots to provide for threaded extension of the clamp cylinder through the top clamp seat.

[5] Also of interest is United States Patent No. 946,619 issued to Orr on January 25, 1910, which discloses a wrench. This patent describes the use of a shank with a flat side including teeth that are adapted to engage a toothed sleeve for positioning the jaws of the wrench. As can be noted by the disclosure of this patent, this teaching is limited in the available positioning of the jaws by the engagement of the teeth.

[6] These prior art patents have several disadvantages including the available adjustment of the systems and the control of the pieces in relation to each other in these systems as well as the overall strength of the system provided by their means of connection. What is needed then is an improved positioning system for clamps and vises.

BRIEF SUMMARY OF THE INVENTION

[7] The present invention provides an improved tension rod positioning apparatus and method for C-type clamps and Vises. The present invention uses at least three teeth on a toothed rod inserted into a toothed hole on an engagement collar. When the rod and hole are aligned, the rod may be freely positioned within the collar. When the rod is inserted into the collar, the three teeth center the rod within the collar to provide an axial alignment of the rod with the hole. When the rod is then turned, the teeth of the rod provide the alignment of the rod and the hole and the turning action engages the rod teeth with the teeth of the engagement collar to turn the engagement collar. The multiple sets of teeth positioned along the

rod and collar along with the axial alignment provided by the teeth provide an increased strength connection and an enhanced positioning for the rod to collar engagement.

[8] The engagement collar includes an external thread sized to fit an internal thread on the clamp base. In this manner, the rod may be inserted and turned in one direction to both engage and turn the engagement collar in order to increase the clamping pressure. After clamping, the rod may be turned in the opposite direction to both loosen the clamping pressure and disengage the engagement collar. Once the rod and collar have been disengaged by aligning the rod and hole of the engagement collar, the length of the rod may be freely moved within the engagement collar to reposition the clamp for the next operation.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[9] 1. Figures 1 through 7 show the C-type clamp of the present invention.

[10] 2. Figures 8 through 11 show the square bar rod lock assembly.

[11] 3. Figures 12 through 15 show the vise base assembly.

[12] 4. Figures 16 and 17 show the moving vise jaw.

[13] 5. Figures 18 and 19 show the cap for the bottom of the vise jaw.

[14] 6. Figure 20 shows the bottom of the moving vise jaw.

[15] 7. Figures 21 through 23 show the clamp block for the vise jaw.

[16] 8. Figure 24 shows the assembled vise.

[17] 9. Figures 25-28 show the threaded insert and the retaining nut.

[18] 10. Figures 29-32 show the threaded insert and the retaining snap ring washer.

[19] 11. Figure 33 shows a cutaway view of the threaded insert and retaining nut mounted in the body.

[20] 12. Figures 34A through 34D show the rotation of the square rod aligned with the square broach and rotated to engage the internal threads of the insert.

DETAILED DESCRIPTION OF THE INVENTION

[21] Figures 1 through 32 show the quick position C-type clamp **10** of the present invention. The opening and closing of the quick position C clamp **10** is a slide and final screw motion instead of the basic all screw method as taught in the prior art. The quick position "C" Clamp **10** is a time saving, labor saving tool. To open a conventional 6" "C" clamp requires approximately 1 to 2 minutes. To open and close the Quick position "C" Clamp **10** requires approximately 2 seconds. The arrangement of the present invention also provides advantages over previous attempts of the prior art methods for C clamps.

[22] As shown in Figure 1, the U-shaped or "C" clamp frame shown as the body **12** is manufactured of cast steel that is used to hold the pressure applied by the handle **21** through the threaded bar **20**, also known as a rod **20** to the bearing pad **13**. The sliding action consists of a bar lock assembly unit **14** shown in detail in Figures 3 through 11 that includes a square threaded bar **20** passing through internal threads **26** on a threaded insert **16** approximately 2 ¾" long, 1" in diameter. The threaded

insert **16** includes both internal clamping threads **26** on an inside hole **18** and multiple rotation external clamping threads **29** on the outer diameter of the insert **16**. The external thread **29** of the threaded insert **16** engages a threaded hole **22** housing a multiple rotation clamping thread **23** in the C clamp body **12**. As the threaded insert **16** is screwed into and out of the C clamp body **12,** the rotation provides a rotationally engaged clamping motion similar to the prior art threads on just the bar assembly. However, we should note that the threaded insert **16** only needs to provide a short range of rotational movement to provide clamping pressure. This is because the square threaded rod **20** provides the large movements for adjustment to the location of the object and the actual clamping position. While the present invention is shown as a square rod and square broach, a triangular rod and broach or other alternative shapes may be utilized for the rod and pass through opening. The important characteristics are the centering of the rod and the proper engagement of the rod to the insert to hold the clamping pressures associated with the size of the clamp or vise being used.

[23] Rotational control of the threaded insert **16** is provided by the square threaded rod **20**. The pass through opening, shown as hole **18**, in the threaded insert **16** has been broached to create a square broach **24** that is slightly smaller than the hole **18** such that it leaves four clamping thread teeth **26** on each un-broached rotation of the internal threads in the hole **18**. The square bar **20** is sized to slide through the square broach **24** and has square grooves **28** sized to engage the remaining internal thread teeth **26**. Thus, if the square of the bar **20** is aligned

with the square broach **24** of the hole **18** then the rod **20** may pass easily into and out of the threaded insert **16** without a rotational movement. This allows for large adjustment of the clamping end of the rod **20** to the object being clamped. When the bar **20** is turned, the rod engages the threaded insert **16** and turns the insert **16**. This operates to rotate the insert **16** inside the body **12** and use the external threads **29** of the insert **16** to close the distance inside the clamp **10** and increase the clamping pressure against the object. Thus, this forces the bar **20** against the object, clamping the object securely.

[24] To release the object, the rod is simply turned to the left to disengage the threads **28** of the square rod **20** from the thread teeth **26** of the threaded insert **16**. Once the thread teeth **28**, **26** are disengaged and the square of the rod **20** is aligned with the square broach **24**, the bar **20** may be slid out of the way to an open position to allow for removal of the object.

[25] This design provides a further advantage because it allows the bar **20** to be replaced if bent or damaged. This contrasts with the prior art designs where the clamp **10** is scrapped when the bar **20** is bent or damaged. The driving pad **33** end of the bar **20** may be provided with threads to make removal of a driving pad **33** easier than normally associated with a pressed on driving pad **33**.

[26] Figures 12 through 15 show the quick position vise **50** base assembly **52**, and Figures 16 through 23 show components of the moving vise **50** clamp jaw **54**. The Quick position vise **50** was designed to slide open and close instead of the conventional screw in and out action of present day vises on the market. The vise

50 also has a jaw opening of 8" as compared to 4" to 5" of other vises. The vise **50** weighs approximately 20 lbs as compared to other large vises with a 6" jaw opening that weight approximately 100 lbs.

[27] The vise **50** is manufactured of cast steel, one-piece construction base **52** with a bearing jaw **51** and slide jaw **54** that clamps the object. The vise **50** incorporates a bar-lock assembly unit **14** shown in Figures 8 through 11 that consists of a threaded insert **16** 1" in diameter with internal threads that have been broached by a square broach **24** leaving partial thread teeth **26** in which a square bar **20** with square thread teeth **28** will slide in and out. As the bar **20** is rotated by the handle **21**, the edges of the square thread teeth **28** of the bar **20** engage the internal thread teeth **26** of the insert **16**, which causes the insert **16** to rotate to the right, clamping the sliding jaw **54** against the object held in the base **52**. To remove the object, simply make one turn of the handle counterclockwise and pull the clamping jaw **54** back. There is no other vise with these features that is this small and that will permit a machinist, tool and die maker, etc. to store the vise **50** in the top of the KENNEDY (trademark), SNAP-ON (Trademark), or other personal tool box.

[28] Figures 12 through 15 show the vise **50** base assembly **52**. Figure 12 shows a top view. Figure 13 shows a side view. Figure 14 shows a cut-away view along line 14-14. Figure 15 shows an end view from position 15-15. The base **52** includes a threaded hole **56** for receiving the threaded insert **16** and a base slot **58** for receiving the bottom extension **60** of the vise jaw **54**. Also shown are U-slots **51** for bolting the vise **50** to a stand.

[29] Figures 16, 17, and 20 show the moving vise jaw **54** from the end, side, and bottom views respectively. The moving vise jaw **54** includes a bottom extension which passes through the base slot **58** in the base **52**. The bottom cap **62** is bolted to the bottom extension **60** to hold the vise jaw **54** in the base **52**. The design of a face plate **64** with v-slots **65** is shown in Figures 21 through 24.

[30] Figure 24 shows the assembled vise with the base **52** and the upright bearing jaw **51** mounted to the moving vise jaw **54** with the installed face plate **64** and the bottom cap **62** connected to the clamping shaft **20**. The clamping shaft **20** is a triangular shaft with three extensions **28**, previously shown as thread teeth **28**, positioned around the shaft. An insert **16** is positioned on the clamping shaft **20** and defines a pass through opening **18** including extension receptors **26** previous shown as thread teeth **26**. The receptors **26** are adapted to engage the extensions **28** and substantially center the shaft **20** inside the pass through opening **18**. The insert **16** further defines a first clamping thread **29**. The rotation of the clamping shaft **20** in relation to the insert **16** in a first direction engages the first extensions **28** into the receptors **26** to turn the insert **16**, and rotation of the clamping shaft **20** in a second direction disengages the extensions **28** from the receptors **26** such that the clamping shaft **20** may freely slide through the pass through opening **18**. The bearing jaw **51** is connected to the body or base **52** which defines a second clamping thread **23** adapted to engage the first clamping thread **29** to adjust the position of the insert **16** in relation to the body **52**. A driving jaw **54** engages the clamping shaft **20** and is adapted to be driven to provide clamping pressure in relation to the bearing jaw **51**.

As previously described, stops **68** are connected to the insert **16** and adapted to limit the movement of the insert **16** in relation to the body **52**.

[31] Figures 25-28 show the threaded insert **16** with end connection threads **63** for a screw type of attachment for a retaining nut **66** with internal connection threads **67**. The retaining nut **66** is screwed onto the threaded insert **16** to provide an insert stop **68**, which is shown as a shoulder **70**, on the retaining nut **66**. As shown in Figures 29 through 32, this insert stop **68** may also be implemented by using a snap ring **72**, or washer **72**, which extends to form the insert stop **68** when it is placed on the retaining slot **74**, also known as groove **74**, on a snap ring style of threaded insert **16**. Alternatively, a washer may be directly welded to the insert. It is important to remember that the external diameter of the metal snap ring **72** should extend outward past the threads **29** on the insert **16** to provide a shoulder to stop the insert **16** against the frame **12**, also known as the body **12**. Snap rings **72** with outside diameters close to the external diameter of the threads **29** can provide problems when the snap ring **72** contacts the internal body threads **23** as internal body threads **23** may try to drive into the snap ring **72** and create problems with the movement of the insert **16** within the frame **12**.

[32] Figure 33 shows a cutaway view of the threaded insert **16** and retaining nut **66** mounted in the body **12** from which it may be understood how a front shoulder **17** on the insert **16** and the nut shoulder **70** on the retaining nut **66** provide the insert stops **68** for the threaded insert **16**. This allows the design to limit the exposure of the clamping threads on the insert to body connection to protect them over the life of the

clamp. As shown in Figures 27, 28, and 33, the stop **68** may be a hex nut which is attached by internal threads on the hex nut to external threads on the insert to provide a shoulder **70** on the back of the insert **16** to retain the insert **16** within the frame body **12**. In this matter, the insert **16** may be constructed with a front shoulder **17** to retain the insert **16** on one end and utilize the hex nut shoulder **70** on the back end to retain the insert **16**.

[33] Figures 34A through 34D show the rotation of the square rod **20** in the square broach **24** between the aligned and threadably engaged positions. Figure 34A shows the points **80** of the square rod **20** aligned with the edges of the square broach **24**. In this position, the square rod **20** may easily slide through the insert **16**. In Figures 34B through 34D one may see how the points **80** of the square rod **20** may be rotated to engage the internal threads **26** of the insert **16** while maintaining the alignment of the rod **20** inside the insert **16**. A minimum of three contact areas are necessary to provide the proper alignment, but this may be implemented with a varying number of teeth according to alternative design embodiments.

[34] Thus, although there have been described particular embodiments of the present invention of a new and useful Quick Position Clamp and Vise, it is not intended that such references be construed as limitations upon the scope of this invention except as set forth in the following claims.